

Patent Claims

1. Device for the layer-by-layer manufacture of a three-dimensional object by means of selective hardening at those sites of a layer of a building material that correspond to the cross-section of the object through the use of a laser, comprising a laser (1) and a focussing unit (6) for the focussing of the laser radiation, characterized in that the laser (1) comprises a device (8) for changing the modal composition of the laser radiation.
2. Device according to Claim 1, characterized in that the device (8) for changing the modal composition comprises at least one mode aperture (3).
3. Device according to Claim 1 or 2, characterized by a unit for beam expansion (4).
4. Method for the layer-by-layer manufacture of a three-dimensional object by the application of laser radiation to the sites of a layer corresponding to the cross-section of the object, characterized in that the laser is operated during the manufacture with the modal composition being adjustable.
5. Method according to Claim 4, characterized in that the modal composition is changed for the purpose of supplying a desired amount of energy.
6. Method according to Claim 4 or 5, characterized in that the modal composition is changed to a lower order mode, preferably to the fundamental mode, depending on the site on the layer that is impacted by the laser radiation.
7. Method according to anyone of the Claims 4 to 6, characterized in that the modal composition is limited to the fundamental mode in a marginal area of a partial area of a layer, said marginal area being impacted by the laser radiation, and in that the modal composition contains higher order modes in addition to the fundamental mode in an inner area of the partial area.
8. Method according to anyone of the Claims 4 to 7, characterized in that the laser radiation is focussed before being impacted.

9. Method according to Claim 8, characterized in that the laser radiation is focussed depending on its modal composition.
10. Method according to Claim 9, characterized in that the laser radiation is focussed more strongly in a marginal area of a partial area of a layer, said marginal area being impacted by the laser radiation, than in an inner area of the partial area.
11. Method according to anyone of the Claims 4 to 10, characterized in that the modal composition is changed depending on the rate at which the focussed beam is moved across the layer.